



## Useful Data in the New European Wind Atlas

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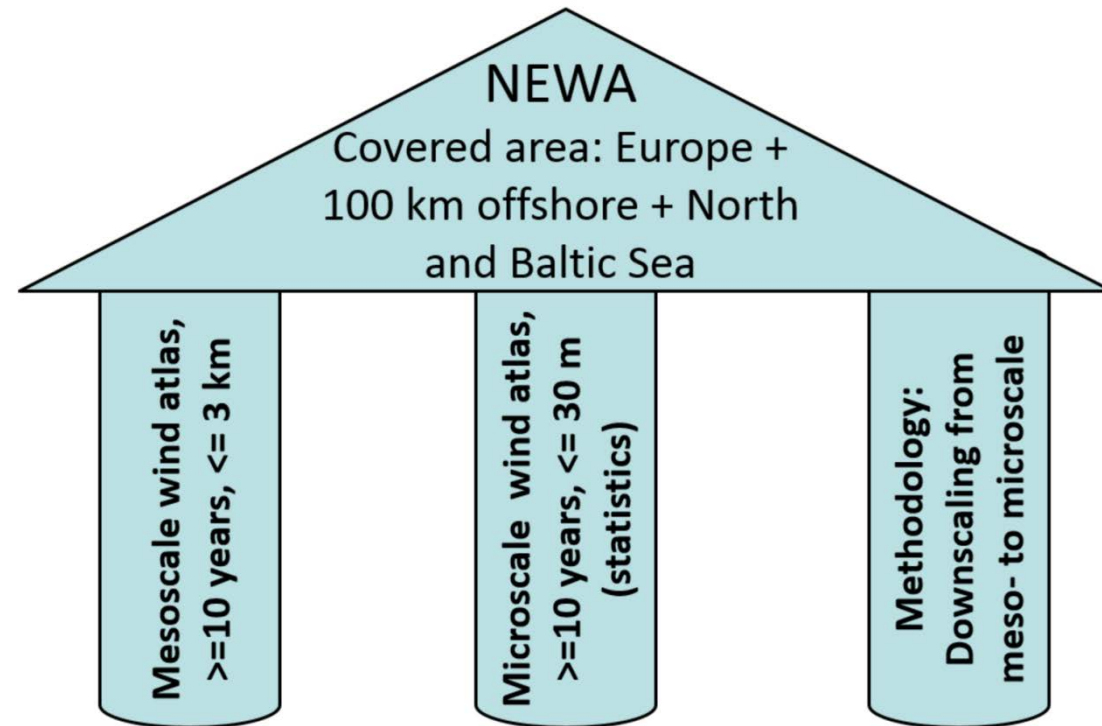
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# NEWA Project Goals

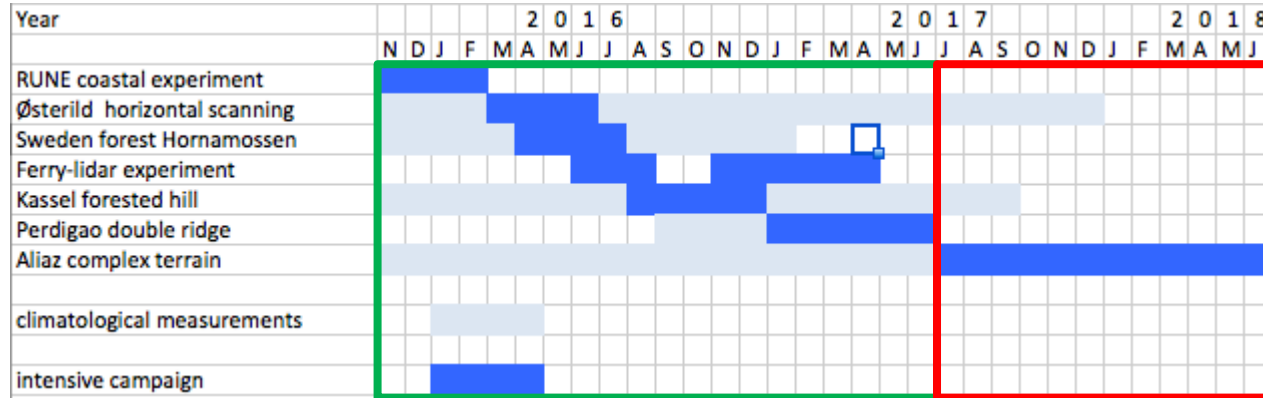
- Accurate mapping of wind conditions for the estimations of resources and loads
- Development and testing of the model chain
- A series of atmospheric field experiments to validate the model and atlas



# NEWA Outcomes

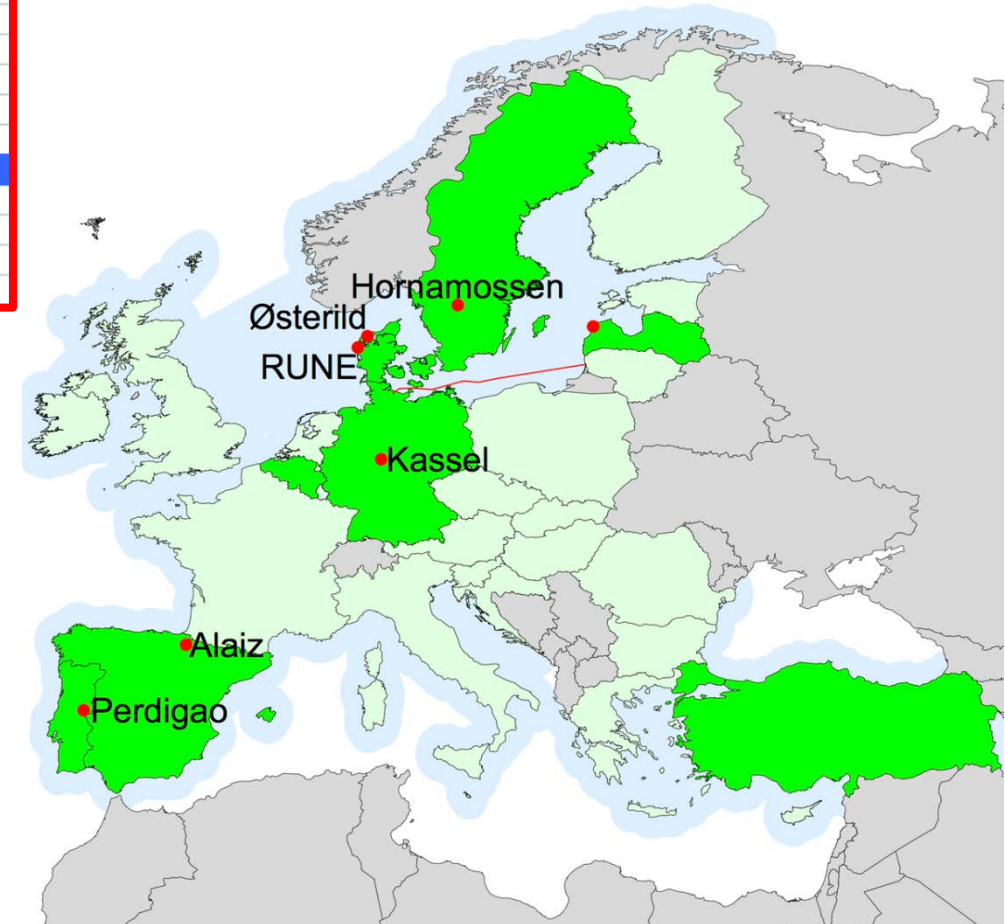
- A unified high resolution and freely available data-set of wind energy resource in Europe
- Wind resources with a resolution  $< 100$  meters in at least 10 wind turbine relevant heights
- Data from large scale field experiments and at least 10 years of mesoscale simulations with a resolution of 2-3 km
- Publicly available data for all EU countries, including 100 km offshore plus the Baltic and the North Sea
- Measures of wind variability, wind power predictability from day-ahead to decadal as well as parameters for wind turbine design

# Experiment Locations and Timeline



completed

- All experiments completed at present except Alaiz complex terrain (starting January 2018)

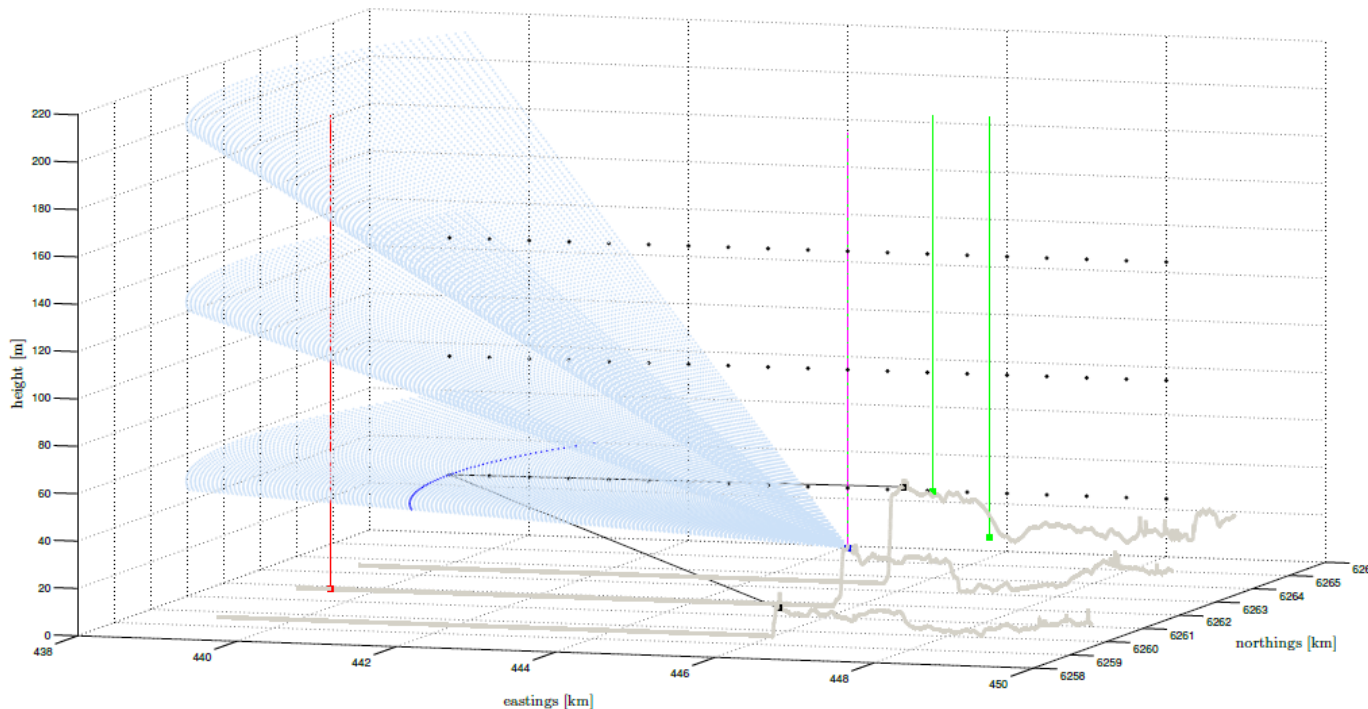


# Experiment 1: RUNE (Denmark)

Reducing Uncertainty of Near-shore Energy Estimates

Date sources:

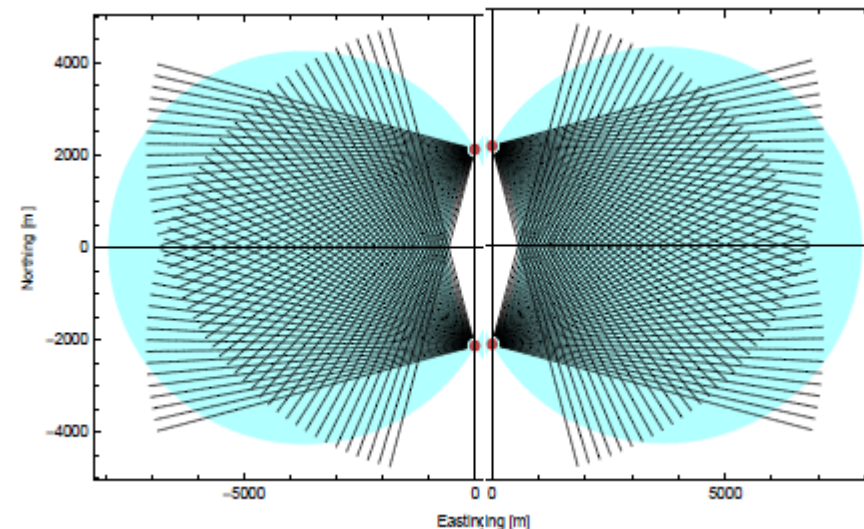
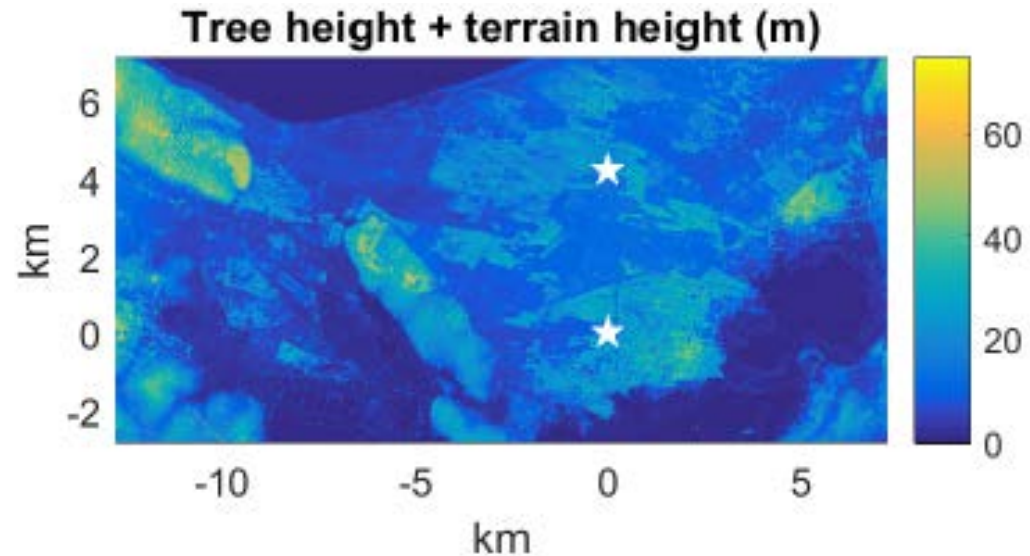
- 3 WindScanners on the coast
- 4 profiling lidars on the coast
- Floating lidar on buoy
- Sentinel-1 satellite winds
- TerraSAR-X satellite winds
- ASCAT| satellite winds
- Sonic + Høvsøre met-mast
- Triaxys wave buoy





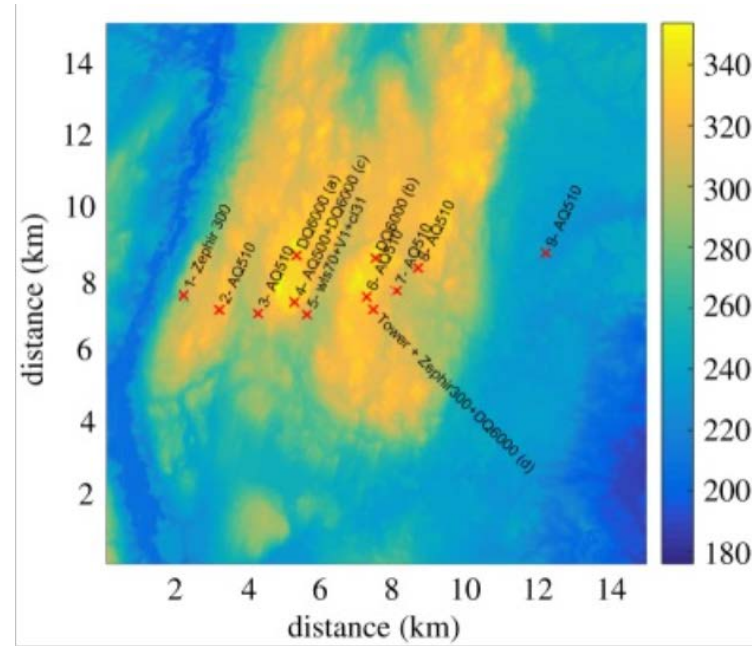
# Experiment 2: Østerild Balconies (Denmark)

- 2 x WindScanners raised to 50m and later 200m AGL (2 months each)
- Scanning horizontally (PPI) with no elevation angle
- Scientific goal(s):
  - How do surface heterogeneities propagate to rotor height?
  - Inflow measurements for very-short term forecasting



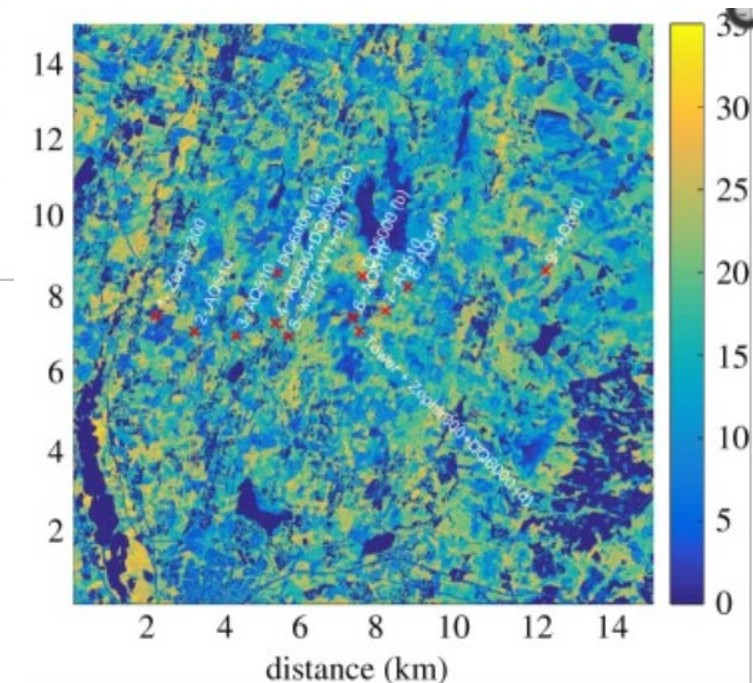
# Experiment 3: Hornamossen (Sweden)

- Scientific goal:
  - Study transition between flat and forested areas
  - Better understand flow over the forest
- Instrumentation:
  - Mast data (180m)
    - 8 sonic anemometers, 10 cups,
    - 10 thermometers, 3 wind vanes
  - Ceilometer, sodar, lidar profiler



Elevation

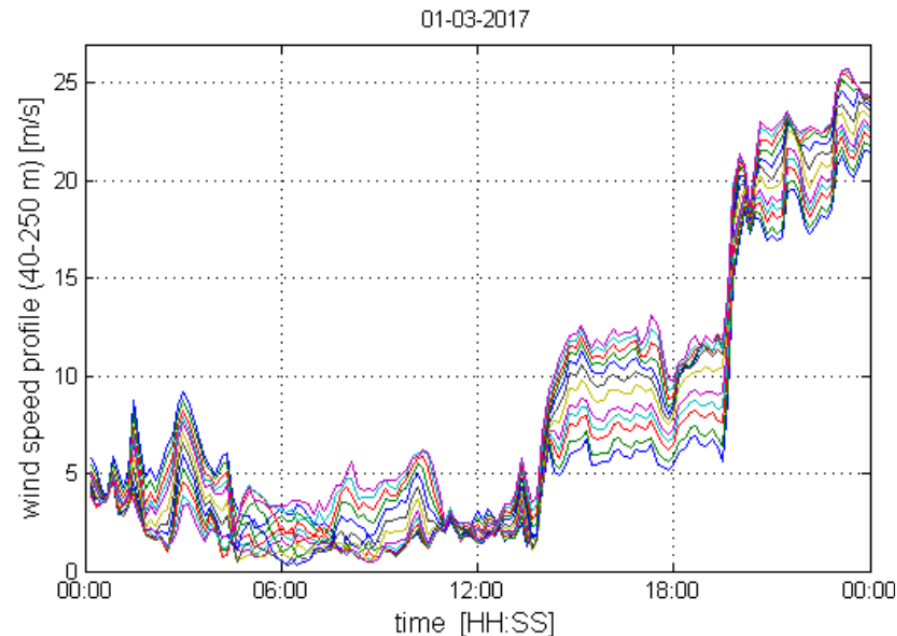
Vegetation height





# Experiment 4: Ferry Mounted Lidar in the Baltic

- Obtain wind profiles over large spatial area with sparse observations
- Heights from 40-250m
- Ship position and velocity also recorded

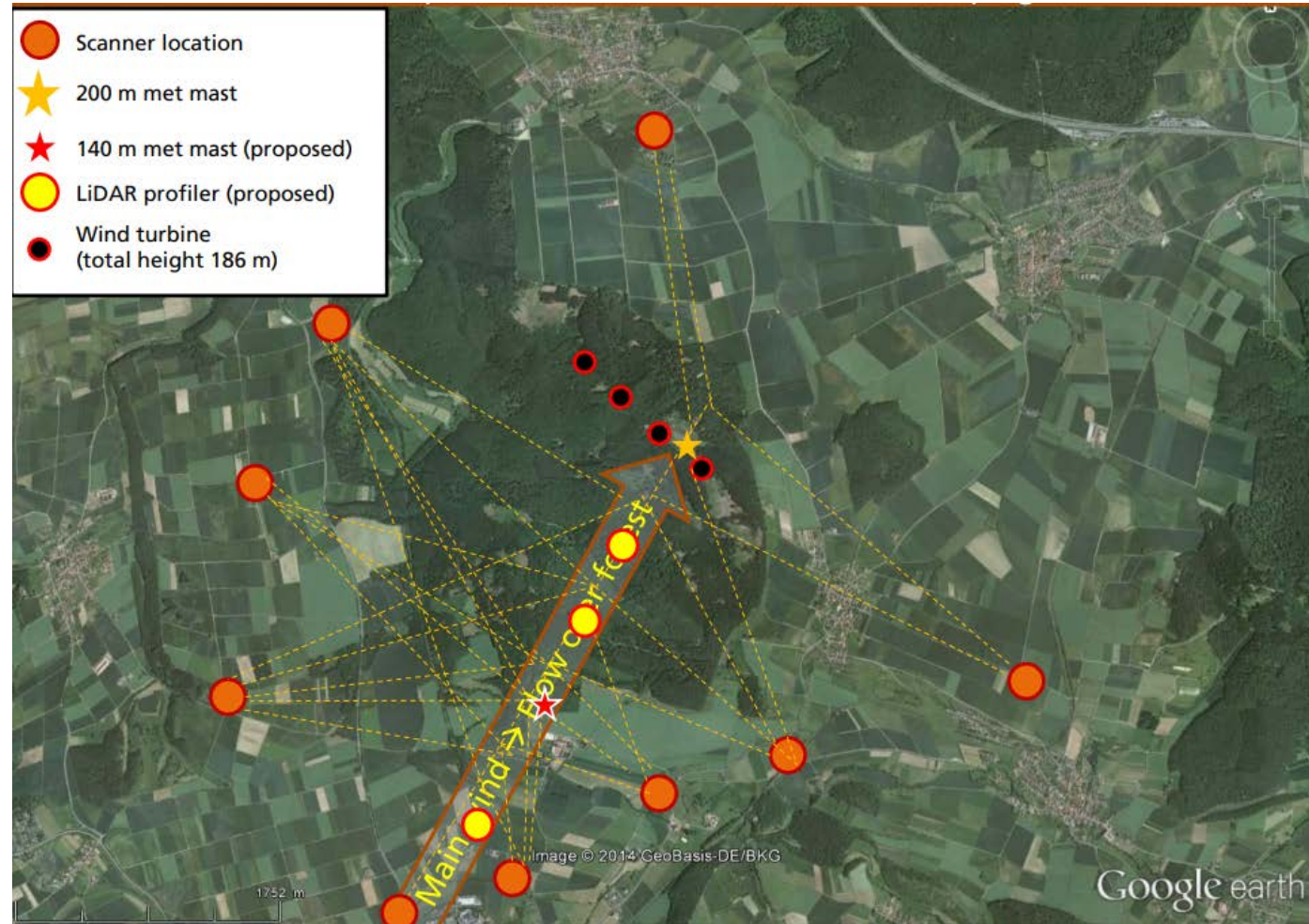


- Route Kiel – Klaipeda selected
- Approved by DFDS Seaways
- Start of campaign early 2017



# Experiment 5: Kassel Forested Hill (Germany)

- Measure complex flow over forested hill and compare with models
- Instrumentation:
  - 2 masts @ 200m and 140m
  - 9 WindScanners
  - 4 lidar profilers
  - 1 ceilometer
- Period:
  - May 2016 – April 2017



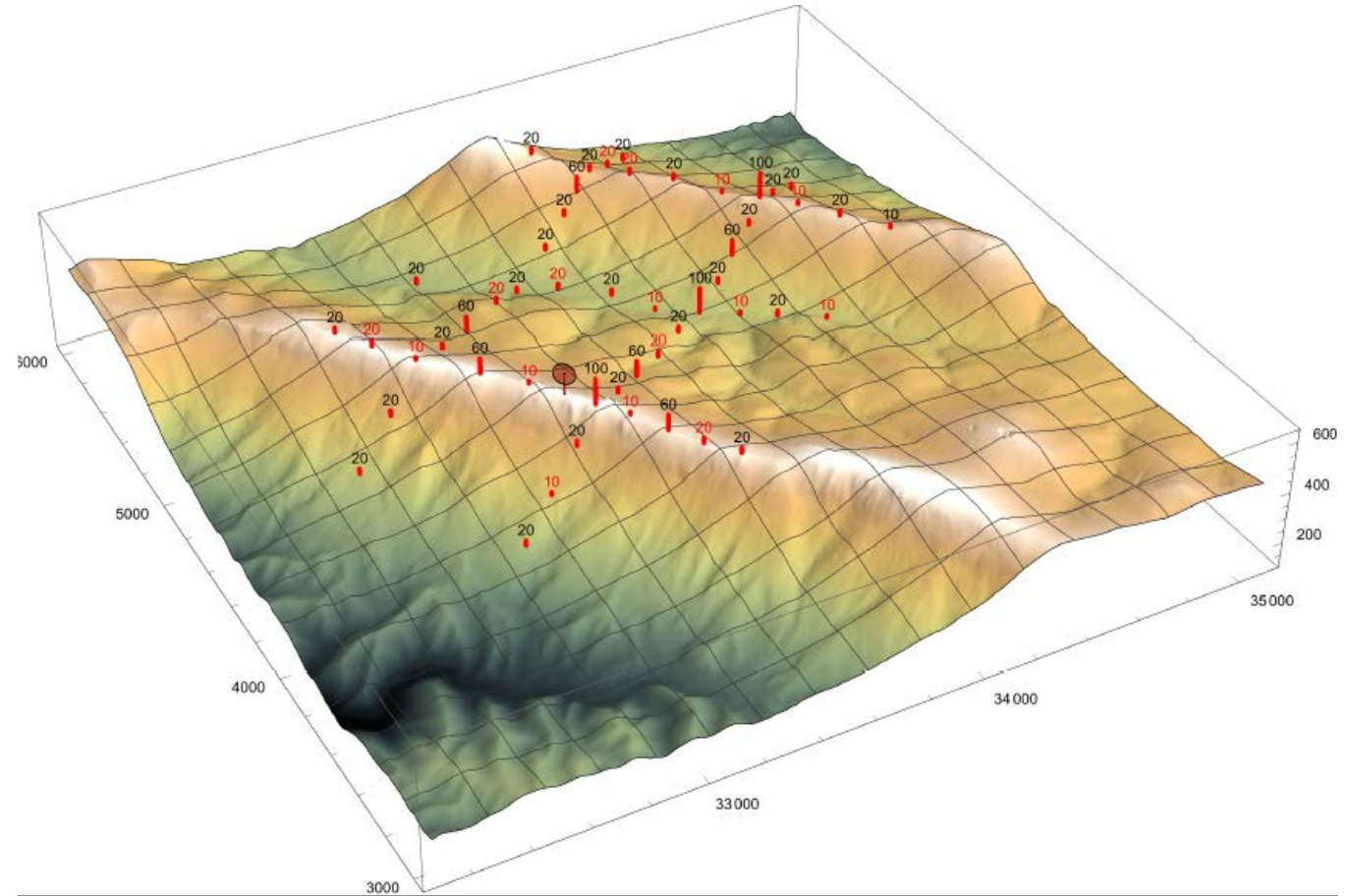


# Experiment 6: Perdigão Double Ridge (Portugal)



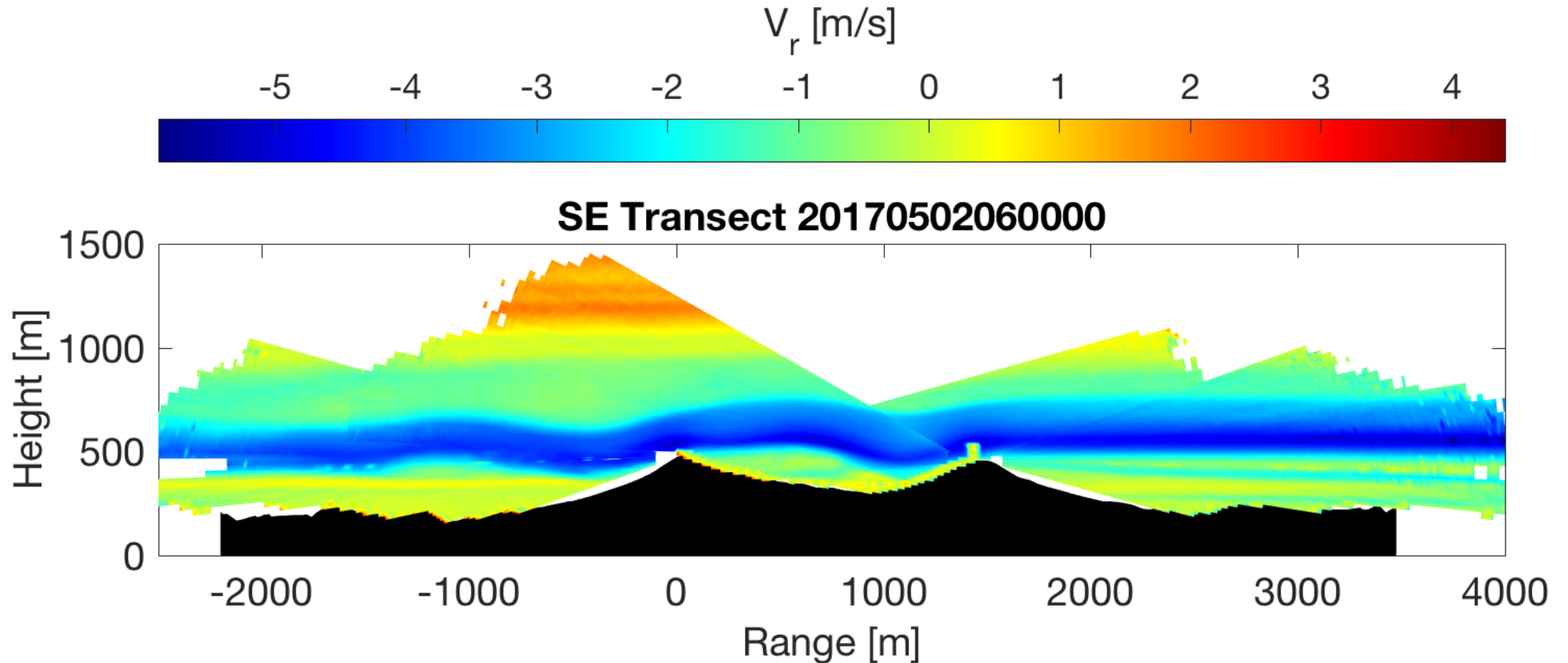
# Experiment 6: Perdigão Double Ridge (Portugal)

- Complex flow with 2 ridges, valley, and a wind turbine
- Instrumentation:
  - 50 met-masts (10–100m with 180+ Sonic anemometers)
  - 20 scanning lidars
  - 7 profiling lidars
  - Radiosondes, tethered balloons
  - Etc..
- Scanning lidar measurements:
  - Scans following ridges (80m AGL)
  - Virtual masts
  - Transect scans through valley





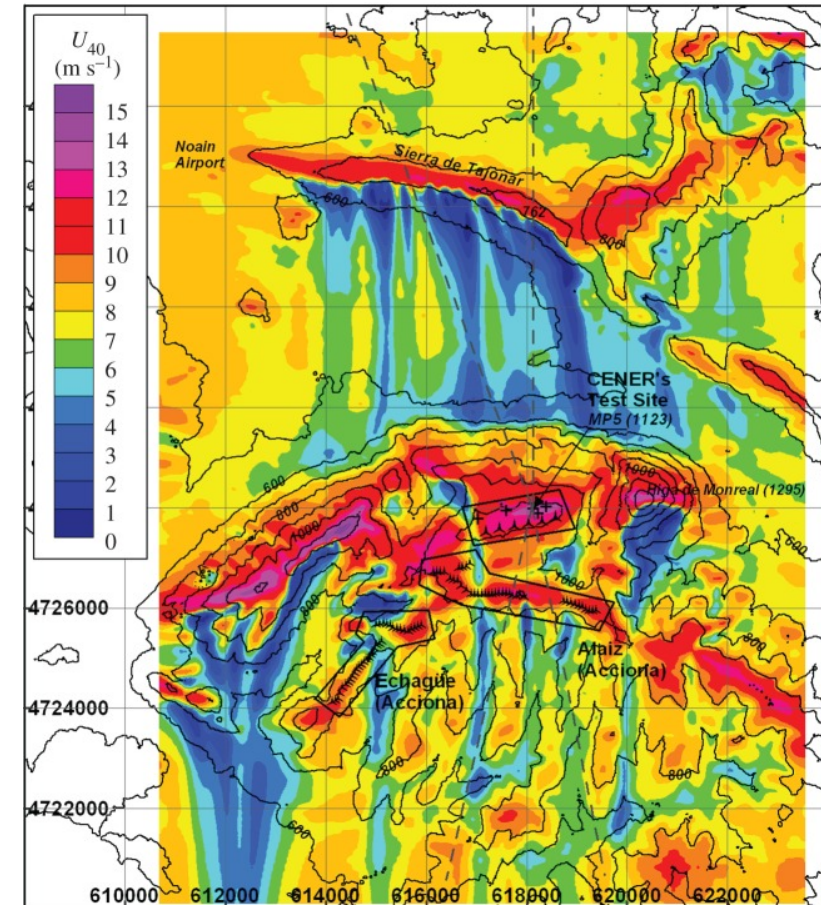
# Transect Scan - 5 May 2017 @ 6:00UTC





# Experiment 7: Alaiz Complex Terrain (Spain)

- Campaign started in November 2017 with 1 profiler
- 5 scanning lidars will be deployed in January 2018
- 4 existing 118m masts
- Mountainous site to be used for evaluating meso/micro coupling



40m wind CFD simulation

- Experiment data is open to NEWA partners (now), public (later)
- NEWA fileserver (ssh/scp): login.neweuropeanwindatlas.eu
  - Experiment data: /newa/WP2
  - Access is granted through Neil Davis <neda@dtu.dk>
  - Current data status:
    - RUNE
      - Fileserver: 3 x raw WindScanner files
      - SQL: Processed PPI, dual Doppler, virtual mast (WS), profiling lidars, wave & lidar buoy (by Guillaume and Elliot)
    - Østerild Balconies
      - Fileserver: 2 x corrected WindScanner files (by Elliot), animated videos of all periods (by Guillaume)
    - Perdigão
      - DTU & DLR processed & raw WindScanner data, [processed RHI plots](#)
      - [NCAR – Field catalogue](#)
    - Hornamossen, Kassel, Baltic ferry
      - Awaiting delivery/upload